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Clinical Trial

Evaluation of the Clinical Rationality of the use of Cefazoxime Sodium for Injection in 328 Cases

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Abstract

Objective: To study the use of cefazoxime sodium for injection in inpatients of the Third People's Hospital of Yancheng City, and to provide reference for the rational clinical use of cefazoxime sodium.

Methods: A retrospective study method was used to retrieve the medical records of patients discharged from 2 departments of urology and general surgery of the hospital using cefazoxime sodium in June-August 2023, and the rationality of the clinical use of injectable cefazoxime sodium was evaluated with reference to the relevant standards.

Results: A total of 328 valid cases were included, of which 6 cases did not meet the dosage criteria, 10 cases did not meet the treatment time criteria; 44 cases did not meet the indication criteria. The comprehensive judgement of the reasonableness of the clinical use of cefazoxime sodium for injection resulted in 272 cases of reasonable use of the drug; 56 cases of unreasonable use of the drug.

Conclusion: The clinical use of cefazoxime sodium for injection in this hospital is irrational and needs to be further strengthened and corrected.

More Information

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Keywords: Cefazoxime sodium for injection; Evaluation criteria; Rational use

Introduction

Cefazoxime, a third-generation cephalosporin, exhibits a broad-spectrum antibacterial effect and is stable against a wide array of β-lactamases produced by both Gram-positive and Gram-negative bacteria, including penicillinases and cephalosporinases. It demonstrates a potent antibacterial effect against Enterobacteriaceae bacteria, such as Escherichia coli, Klebsiella pneumoniae, and Proteus mirabilis, but shows reduced sensitivity to Pseudomonas aeruginosa and Acinetobacter. Cefazoxime maintains good antibacterial activity against Haemophilus influenzae and Neisseria gonorrhoeae. Its efficacy against Staphylococcus aureus and Staphylococcus epidermidis is less than that of first and second-generation cephalosporins. Methicillin-resistant Staphylococcus aureus and enterococci are resistant to this drug, whereas various species of streptococci are highly sensitive to it. Anaerobic bacteria, including Peptococcus, Peptostreptococcus, and some species of Bacteroides, are mostly sensitive to cefazoxime, while Clostridium difficile exhibits resistance. Routine dynamic monitoring of antimicrobial drug usage at Yancheng Third People's Hospital (referred to as "our hospital") revealed that in June and July 2023, the injection of cefazoxime sodium topped the ranking of antimicrobial drug usage. In terms of departmental usage, the Urology Department and the General Surgery Department were the top two departments. To gather clinical usage information on the injection of cefazoxime sodium, all discharge patient medical records involving the injection of cefazoxime sodium from these two departments between June and August have been randomly selected. The usage of the injection of cefazoxime sodium in each patient's medical record is currently being analyzed and evaluated.

Materials and methods

Data source

From our hospital's computerized electronic medical

record system, we retrieved the medical records of discharged patients who received cefazoxime sodium injections in the Urology and General Surgery departments between June and August 2023. Among these, 328 patient cases were randomly selected for review and analysis.

Methods

Extract the electronic medical records of all patients who were administered cefazoxime sodium for injection (trade name Gaibaoshiling, manufactured by Southwest Pharmaceutical Co., Ltd.), and compile their basic information (medical record number, age, gender), clinical diagnoses, medication details (route of administration, dosage and frequency, timing of administration, whether combined with other medications), and related laboratory tests.

Criteria for rational use

Based on the medication practices of clinical physicians, patients using injectable cefazoxime sodium are categorized into two groups: therapeutic use (with a clear clinical diagnosis of bacterial infection and evidence from etiological examinations, including drug sensitivity results for non-surgical use) and surgical perioperative prophylactic use (for surgery, to prevent postoperative incisional infections, and for infections at the surgical site and potential systemic infections that may occur after contamination or dirty surgery). According to the requirements of the drug instructions, the "Chinese Pharmacopoeia" and the "Guiding Principles for Clinical Application of Antimicrobial Agents" issued by the former Ministry of Health, the rational use of injectable cefazoxime sodium for each patient is comprehensively judged (Table 1).

Outcome

Medication ratio

Two departments discharged a total of 886 patients from June to August. Of these, 328 patients received cefazoxime sodium injections, which represents 37.02% of the total. Out of those treated with the medication, 29 cases were for therapeutic purposes, constituting 8.84% of the group, while 299 cases were for perioperative prophylaxis in surgeries, making up 91.16%. Specifically, 8 cases involved Class I incisions, and 291 cases involved Class II incisions.

Indication rationality

The use of cefazoxime sodium injections in our hospital is primarily for perioperative prophylaxis across two departments. Class I incisions, which include 8 cases (such as partial thyroidectomies, abdominal hernia repairs, and breast surgeries), all lacked indications for medication use. Class II incisions had 291 cases, with 30 surgeries also lacking indications for medication use. All instances without medication indications are deemed irrational, as indicated in Tables 2,3.

The rationality of dosage and frequency

Based on the guidelines provided by the Chinese Pharmacopoeia and drug labels, the standard dosage for cefazoxime sodium injection is 1-2 grams daily. Upon reviewing the usage of cefazoxime sodium injection at our hospital, the overall assessment indicates: six instances of inappropriate medication use (1.83%), and three hundred twenty-two instances of appropriate medication use (98.17%). Specifically, there is one case of inappropriate therapeutic medication use, and five cases of inappropriate perioperative prophylactic medication use. For further details, please refer to Table 4. The recommended frequency for administering cefazoxime sodium injection is 2-3 times daily, and all instances within this statistical period adhered to this frequency, with no cases of inappropriate medication use.

The rationality of medication timing

Therapeutic medications were not discontinued within 72 hours after the infection symptoms had significantly improved, which is considered reasonable. Perioperative medication is categorized into Class I incision surgeries and Class II incision surgeries. For Class I incisions, the duration of medication should be ≤ 24 hours, and for Class II incisions, it should be ≤ 48 hours. Any medication duration beyond these limits is considered unreasonable use [1]. Upon investigation, there were 7 cases of rational medication use for Class I incisions and 1 case of irrational medication use; for Class II incisions, there were 282 cases of rational medication use and 9 cases of irrational medication use (Table 5).

Statistics of irrational medication use

Upon comprehensive analysis, irrational medication use

Table 1: Criteria for judging the rationality of clinical use of cefazoxime sodium for injection.

Norm		Reasonable	Unreasonable
Indications		Therapeutic use or perioperative prophylactic use that matches the antibacterial spectrum	Treatment or perioperative prophylactic use with an antibacterial spectrum that does not match
Dosage		Normal adults: 1-2 g per day; severe infections: 3-4 g per day	Normal adults: more than 2 g or less than 1 g per day; severe infection patients: more than 4 g per day
Frequency		Twice daily; for severe infections, it can be administered three times daily	Less than 2 times daily or more than 3 times daily
Treatment course	Therapeutic drugs	Discontinue within 72 h of significant improvement in symptoms of infection	Discontinued more than 72 h after significant improvement in symptoms of infection
	Perioperative drugs	Class I incision≤24 hours Class II incision≤48 hours	Class I incision≥24 hours Class II incision≥48 hours

Table 2: Statistics on the use of cefazoxime sodium for injection in various departments (cases).

Projects		General surgery	Urology	Total
Total cases		399	487	886
Use of cefuroxime sodium		147	181	328
Therapeutic drugs		11	18	29
perioperative prophylactic drugs	Class I incision	8	0	8
	Class II incision	128	163	291

Table 3: Statistics on the rationality of the indications for the use of cefazoxime sodium for injection (cases).

Projects	General surgery		Urology		Total	
	Reasonable	Unreasonable	Reasonable	Unreasonable	Reasonable	Unreasonable
Therapeutic drugs	11	0	18	0	29	0
Perioperative prophylactic drugs	128	8	133	30	261	38
Total	139	8	151	30	290	38

Table 4: Dosage statistics for the use of cefazoxime sodium for injection (cases).

Projects		General surgery		Urology		Total	
		Reasonable	Unreasonable	Reasonable	Unreasonable	Reasonable	Unreasonable
Therapeutic drugs		11	0	17	1	28	1
Perioperative prophylactic drugs	Class I incision	8	0	0	0	8	0
	Class II incision	128	0	158	5	286	5
Total		147	0	175	6	322	6

Table 5: Reasonable duration of perioperative dosing of cefazoxime for injection (cases).

Projects		General surgery		Urology		Total	
		Reasonable	Unreasonable	Reasonable	Unreasonable	Reasonable	Unreasonable
Perioperative prophylactic drugs	Class I incision	7	1	0	0	7	1
	Class II incision	122	6	155	3	277	9
Total		129	7	155	3	284	10

is primarily evident in three areas: inappropriate dosage, incorrect medication timing, and unsuitable indications (Table 6).

Table 6: Statistics on irrational use of medication (n = 328).

Type of Irrationality	Cases	Proportion
Inappropriate indications	44	13.41%
Unreasonable dosage	6	1.83%
Unreasonable medication timing	10	3.05%

Discussion

Accurately grasping indications

Of the 328 cases involving the use of cefazoxime sodium for injection, 299 were for perioperative prophylaxis, constituting 91.16% of the total. This indicates that the majority of cefazoxime sodium for injection administered in our hospital is for perioperative prophylaxis. Among these cases, 8 involved Class I incisions, all of which were deemed irrational due to the absence of medication indications. For Class II incisions, there were 291 cases, with 30 surgeries lacking medication indications. It is evident that the use of prophylactic medication during the perioperative period is a significant factor contributing to the extensive use of cefazoxime sodium for injection in our hospital.

Cefazoxime sodium was launched in Japan in 1982 and introduced in China in 1989. It is a third-generation, broad-spectrum, semi-synthetic cephalosporin antibiotic that functions by inhibiting the biosynthesis of bacterial cell wall peptidoglycan, thereby achieving antibacterial effects [2]. Cefazoxime sodium exhibits significant antibacterial activity against both Gram-positive and Gram-negative bacteria and is commonly utilized to treat sepsis, respiratory tract infections, urinary and reproductive system infections, pleurisy, peritonitis, cholecystitis, and bacterial uterine infections. When treating abdominal and pelvic infections, it should be administered in conjunction with anti-anaerobic agents, (such as metronidazole) [3,4].

The widespread use of cefazoxime sodium for injection is largely due to its adoption by many clinical physicians as a prophylactic antimicrobial agent to prevent infections in related perioperative incisions. Clinical guidelines routinely recommend first and second-generation cephalosporins as prophylactic drugs for the perioperative period, and generally advise against the use of broad-spectrum antimicrobial drugs for this purpose. Specifically, only cefoperazone±metronidazole is recommended for surgeries involving the colon, rectum, appendix, hepatobiliary system, and pancreas. Studies have found that ceftriaxone and cefazoxime, both belonging to the third generation of cephalosporins, have no significant difference in efficacy, but ceftriaxone is more cost-effective [5,6]. Therefore, physicians must strictly adhere to the indications, and if digestive system surgery is not involved, cefazoxime sodium for injection should not be administered.

Inappropriate dosage of medication

The correct dosage and frequency of cefazoxime sodium injections for adults are typically as follows: 1-2 grams daily, administered twice intravenously. For patients with severe infections, the daily dose may be increased to 3-4 grams, and it can be administered three times a day. In patients with compromised kidney function or the elderly, the dose should be reduced or the interval between doses extended, with careful monitoring of kidney function. In this study, involving 328 patients, the frequency of administration was twice daily, with no instances of unreasonable dosing. Apart from patients with severe infections receiving treatment medication, the dosage for perioperative prophylaxis was the standard amount. There was one case of an unreasonable dosage in the treatment medication group and five cases in the perioperative prophylaxis group, totaling six cases of inappropriate medication, all of which involved underdosing. Such low dosages can impact the pharmacokinetics/pharmacodynamics (PK/PD) of cephalosporin drugs, potentially preventing the attainment of effective bactericidal concentrations, shortening the duration for which the drug concentration exceeds the target threshold (%T>MIC), and ultimately compromising the efficacy of anti-infective treatment [7]. Simultaneously, if the dosage of antimicrobial drugs is insufficient, the concentration within the body may not be adequate to eradicate bacteria, leading to the survival of drug-resistant mutant strains. These drug-resistant mutants proliferate within the human body, causing recurrent infections and extending the duration of the illness [8,9]. Therefore, it is recommended that hospitals enhance the management of cefazoxime sodium injection dosages and improve the clinical efficacy of the medication.

Inadequate anti-infective regimen

According to the "Guidelines for Clinical Application of Antimicrobial Agents," the effective coverage time of cefazoxime sodium for injection should encompass the entire surgical process and the immediate postoperative period. The total duration of prophylactic medication for Class I incision surgeries should generally not exceed 24 hours, whereas for Class II incision surgeries, it may be extended up to 48 hours. In a survey of 299 surgical medication cases at our hospital, there was one instance of Class I incision surgery with an excessively long duration of prophylactic medication, reaching 72 hours. For Class II incision surgeries, there were nine cases of irrational medication, with durations often ranging from 3 to 7 days. In one case, medication continued until the patient was discharged, indicating a phenomenon of prolonged postoperative medication, and during this period, the patient showed no obvious signs of infection. Studies have shown that extending the duration of postoperative antimicrobial treatment during the perioperative period does not reduce the incidence of postoperative infections [10,11]. Correctly determining the duration of anti-infective treatment not only reduces adverse reactions and the emergence of drug-resistant strains but also lowers the cost of patient treatment and reduces the waste of medical resources [12]. Therefore, it is recommended that hospitals strengthen the management of dosages for cefazoxime sodium for injection to improve its clinical efficacy.

Therefore, our hospital needs to strengthen the management of the use of cefazoxime sodium for injection. It is recommended that our hospital, based on actual conditions, refer to relevant guidelines and specifications, strictly limit indications, standardize drug dosages, enhance communication with clinical doctors, and develop reasonable anti-infective treatment plans in combination with the specific circumstances of patients, to further improve the rational use of antimicrobial drugs.

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